

# **EXHIBIT "A"**

**ENGINEER'S REPORT**  
of the  
**McKEAN RESIDENCE FIRE**

Prepared by:

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February 5, 2013

## **McKEAN RESIDENCE FIRE**

### **ENGINEER'S REPORT**

**February 5, 2013**

#### **A. INTRODUCTION**

On September 22, 2011, a fire occurred at the residence of Stephen and Michele McKean located at 803 Raymondskill Road, Milford, Pennsylvania.

My investigation was performed to determine whether a ceiling fan/light above the living room could be ruled out as a cause of the fire.

#### **B. MATERIALS AVAILABLE FOR REVIEW**

1. Letter from Nationwide to Stephen McKean dated September 30, 2011
2. January 19, 2012 Report of John Scala, Ph.D. CCM Meteorological Consultant
3. October 10, 2011 Report of Certified Fire Investigator Thomas Jones
4. Supplemental Examination with dates of February 1, 2012 and February 3, 2012 by Certified Fire Investigator Thomas Jones
5. First set of photographs of the site of the fire
6. Second set of photographs of the site of the fire
7. Statement Under Oath of Michele McKean taken December 27, 2011
8. Statement Under Oath of Stephen McKean taken December 27, 2011
9. The Amended Complaint
10. Home Replacement Appraisal requested by Nationwide Insurance dated October 31, 2009
11. Miscellaneous documents
12. Photographs from my December 10, 2012 inspection

### **C. BACKGROUND**

Certified Fire Investigator Thomas Jones investigated the cause of the fire. In his October 10, 2011 report he stated, "In conclusion based upon a reasonable degree of fire investigative certainty it is my opinion that this fire was Arson and incendiary in nature. There are 5 distinct and separate points of origin. There is no communication between the 5 points of origin found." He also stated, "On the middle couch the ceiling light/fan had fallen. The fan was examined and there is no sign of any malfunction or unusual electrical activity."

The McKean residence has an open layout with no walls to separate the kitchen, dining, and living areas. The locations of the origins identified by Mr. Jones are all within this open area. Following the fire, soot and fire debris were found in many remote areas of the 2 story house. Mr. Jones confirmed this in his report where he states, "There are heavy carbon deposits in the entire home indicating a slower type of smoldering fire."

The ceiling fan/light was found on the sofa below where it had hung prior to the fire. There were significant parts of the ceiling fan/light that had not been examined prior to the December 10, 2012 inspection.

### **D. OCTOBER 10, 2011 REPORT OF CERTIFIED FIRE INVESTIGATOR THOMAS JONES**

1. "The ceiling light and fan above the couch would have been on."
2. "My examination shows no forcible entry into the home. There are heavy carbon deposits in the entire home indicating a slower type of smoldering fire. In the kitchen on the table there are papers on the table that were set on fire. On the kitchen floor along the north wall there is an origin on the floor with combustible materials. In the living room there is a point of origin on the front couch, the middle couch and a chair along the rear. Between the two couches there is a distance of 36 inches. Between the couch and the chair the distance is 16 inches. There is lesser damage on the chair side adjacent to the couch. The most severe damage to the chair is on the seat area."
3. "On the middle couch the ceiling light/fan had fallen. The fan was examined and there is no sign of any malfunction or unusual electrical activity."
4. "State Police Fire Marshal Tpr. Russ Andress was contacted via telephone. He advised that he found multiple points of origin in the home and has ruled the fire incendiary and Arson. His investigation is continuing."
5. "In conclusion based upon a reasonable degree of fire investigative certainty it is my opinion that this fire was Arson and incendiary in nature. There are 5 distinct and separate points of origin. There is no communication between the 5 points of origin found."

**E. SUPPLEMENTAL EXAMINATION WITH DATES OF FEBRUARY 1, 2012 AND FEBRUARY 3, 2012 BY CERTIFIED FIRE INVESTIGATOR THOMAS JONES**

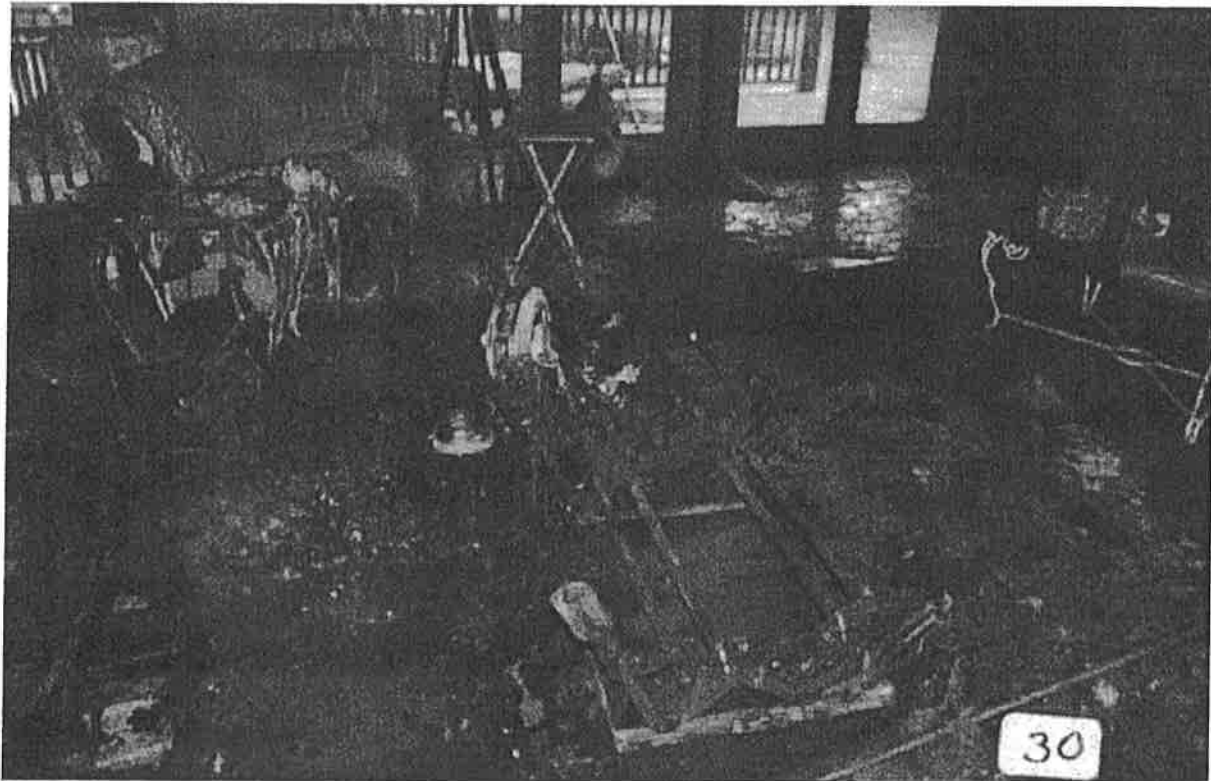
1. "Ken Miller is the owner of Ken Miller Electric. He was requested to examine and remove the box for the light/fan fixture and the breaker that controlled the fixture. Miller removed the sheet rock from the fixture area. He uncovered a plastic junction box that had secured the light fixture. According to Miller the junction box should be metal as per code. He then traced the wire to the electrical distribution panel. Miller removed a 20 amp breaker that controlled the ceiling light/fan fixture. The breaker was a 20 amp Cutler Hammer breaker and was tripped. After removing the breaker Miller advised there was a small arc on the bus bar that occurred when the breaker tripped."
2. "I photographed the junction box in place prior to removal. The box had melted allowing the ceiling light/fan to fall on the origin couch beneath the fixture. There is no unusual electrical activity observed on the wiring and the wire nuts were still in place securing the stranded copper wire to the romex wire. There is no charring to the ceiling joist to which the plastic junction box was secured."
3. "This examination of the plastic junction box, ceiling joist and breaker would eliminate the ceiling light/fan as an ignition source for this fire event. The heat generated on the origin couch caused the plastic junction box to melt and allow the fan to fall on the couch below."

**F. LETTER FROM NATIONWIDE TO STEPHEN McKEAN DATED SEPTEMBER 30, 2011**

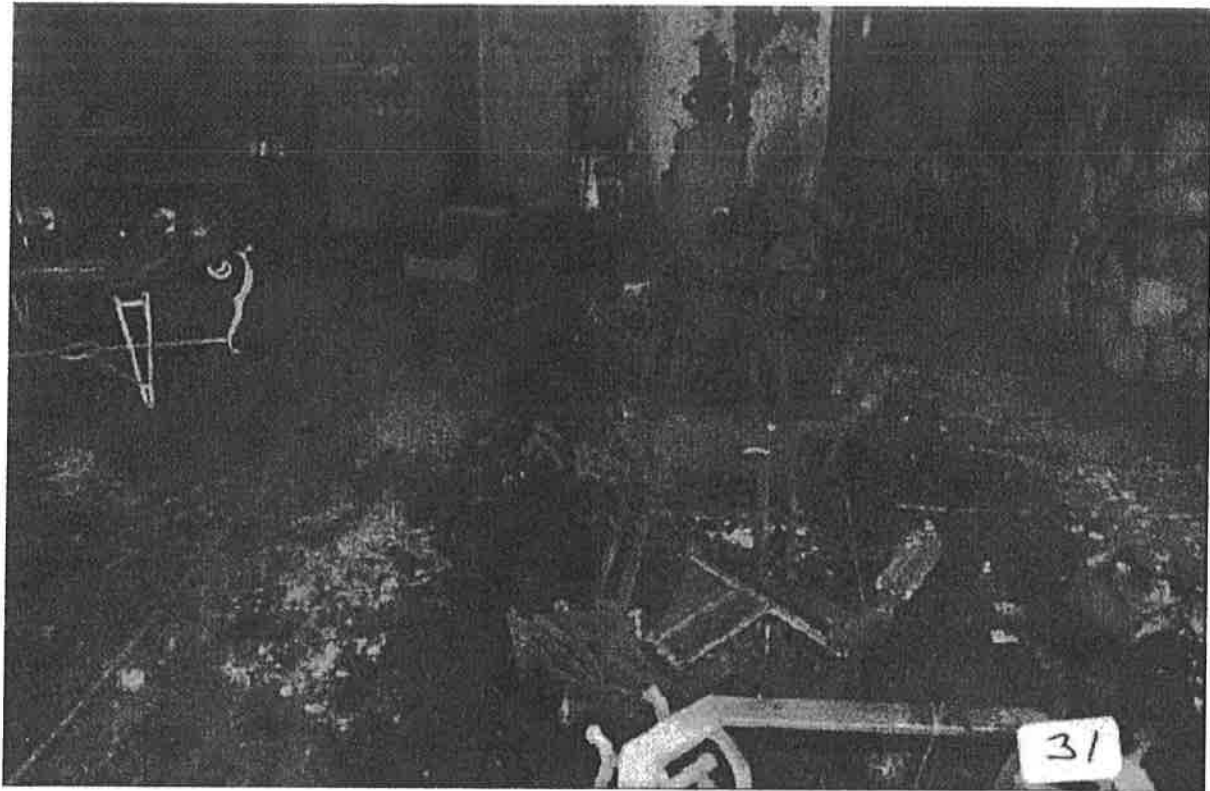
1. The claim number is 58 37 HP 010364 0922201101. The date of loss is September 22, 2011.
2. "On September 22, 2011, we received a homeowner claim reported as a fire on your property located at 803 Raymondskill Road Milford, PA 18337. A preliminary investigation has revealed that there are five points of origin within your home and fire is being ruled incendiary." NW-MCKE 000952

**G. FIRST SET OF PHOTOGRAPHS OF THE SITE OF THE FIRE**

1. Burned debris and soot are evident in numerous photographs at various locations in the house.
2. Site photographs are shown in **Figures 1 - 7.**



**Figure 1**



**Figure 2**

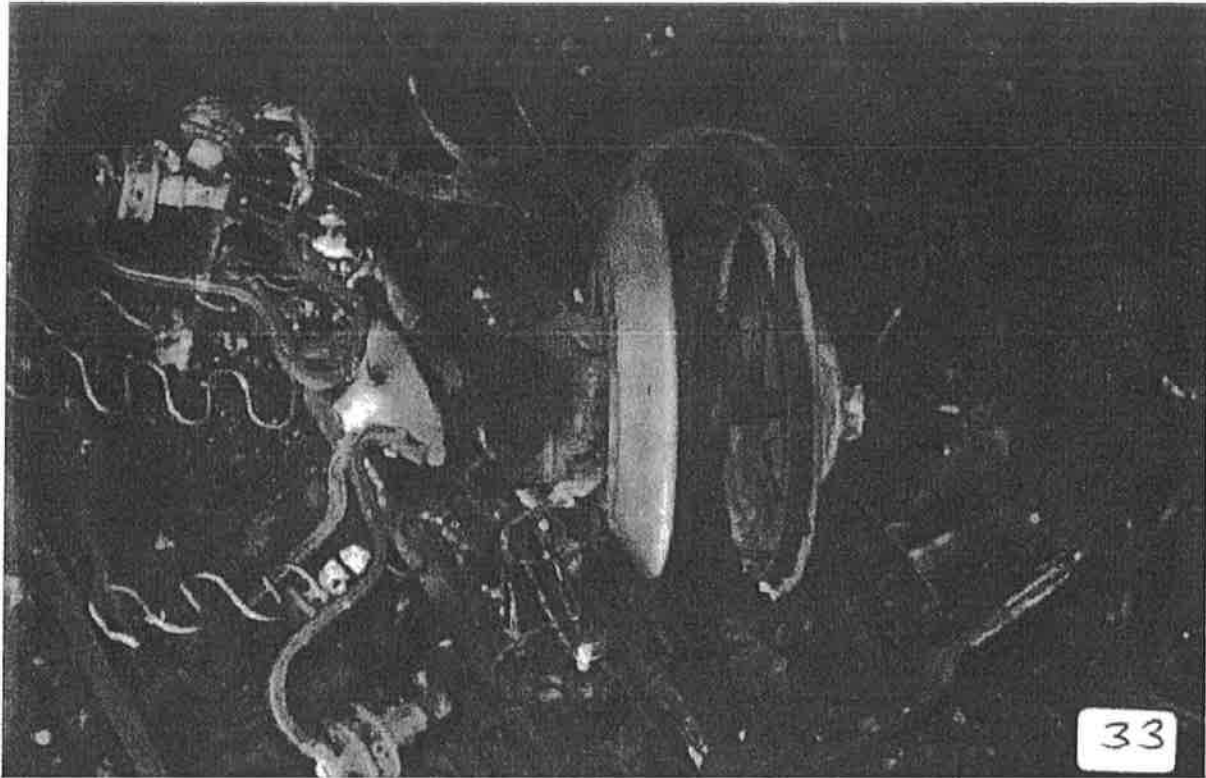
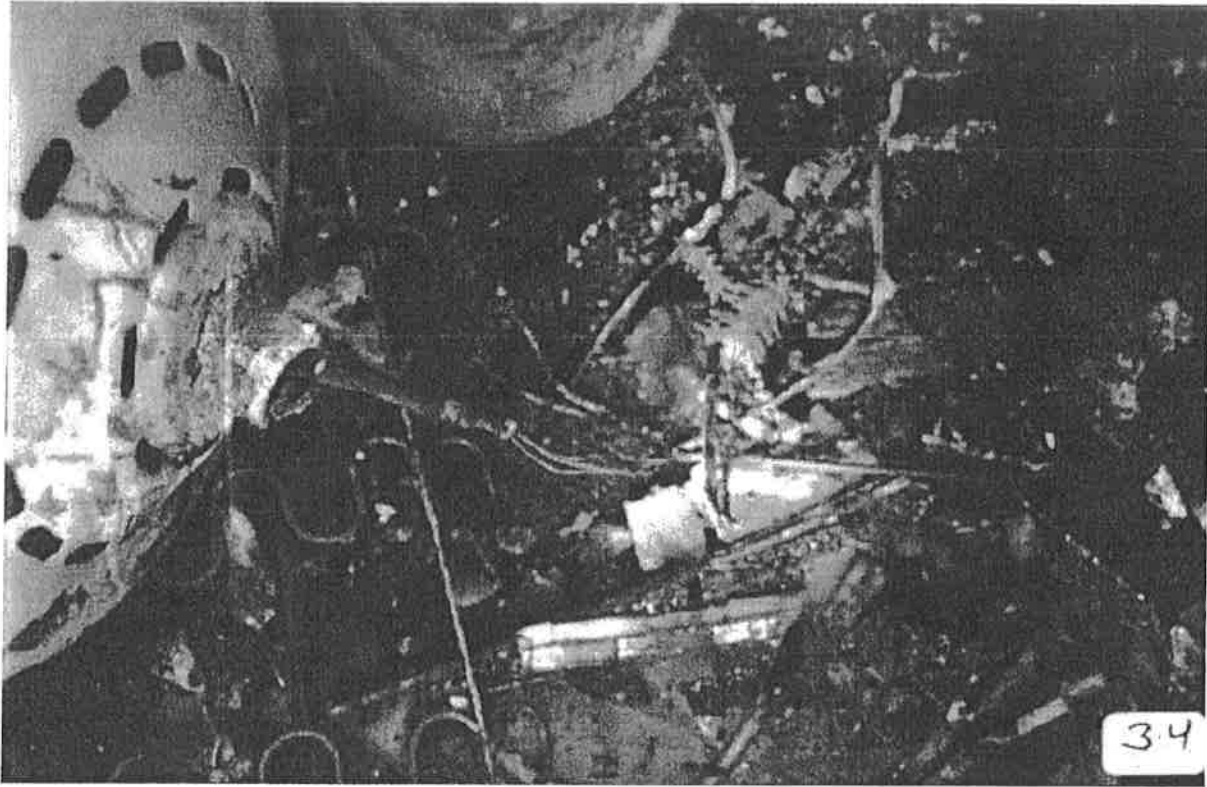


Figure 3





**Figure 4**



**Figure 5**



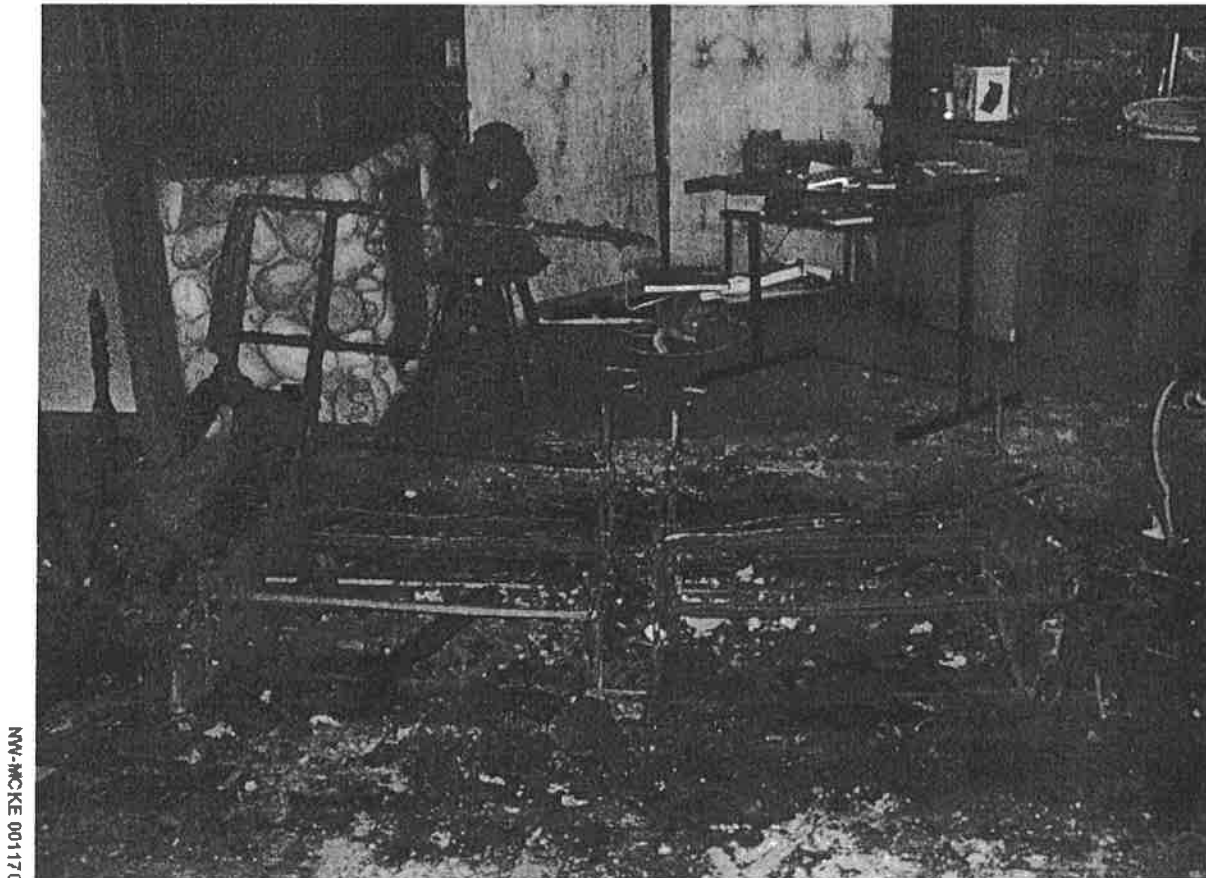
**Figure 6**



Figure 7

#### H. SECOND SET OF PHOTOGRAPHS OF THE SITE OF THE FIRE

1. Burned debris and soot are evident in numerous photographs at various locations in the house.
2. Site photographs are shown in **Figures 8 - 10**.



**Figure 8**

NW-MCKE 001172

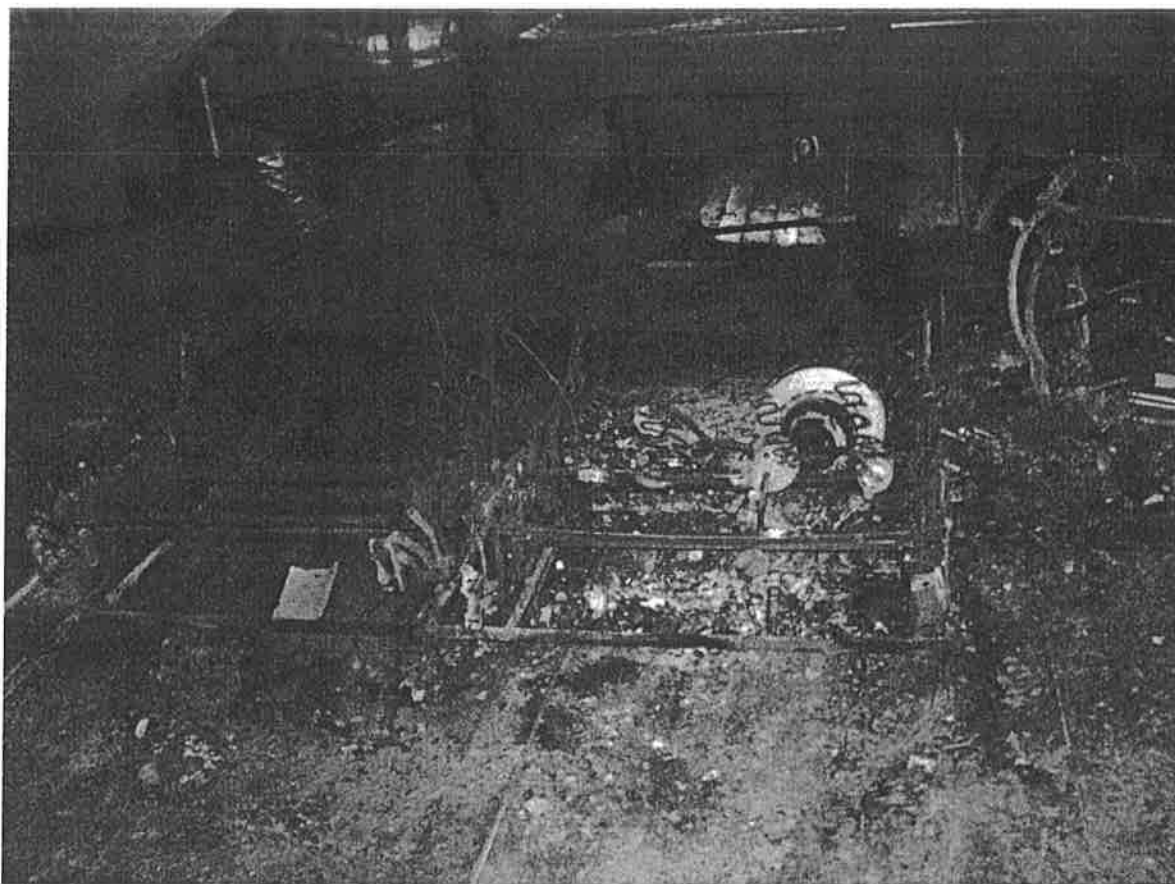


Figure 9

NW-MCKE 001173



Figure 10



**I. STATEMENT UNDER OATH OF STEPHEN McKEAN TAKEN DECEMBER 27, 2011**

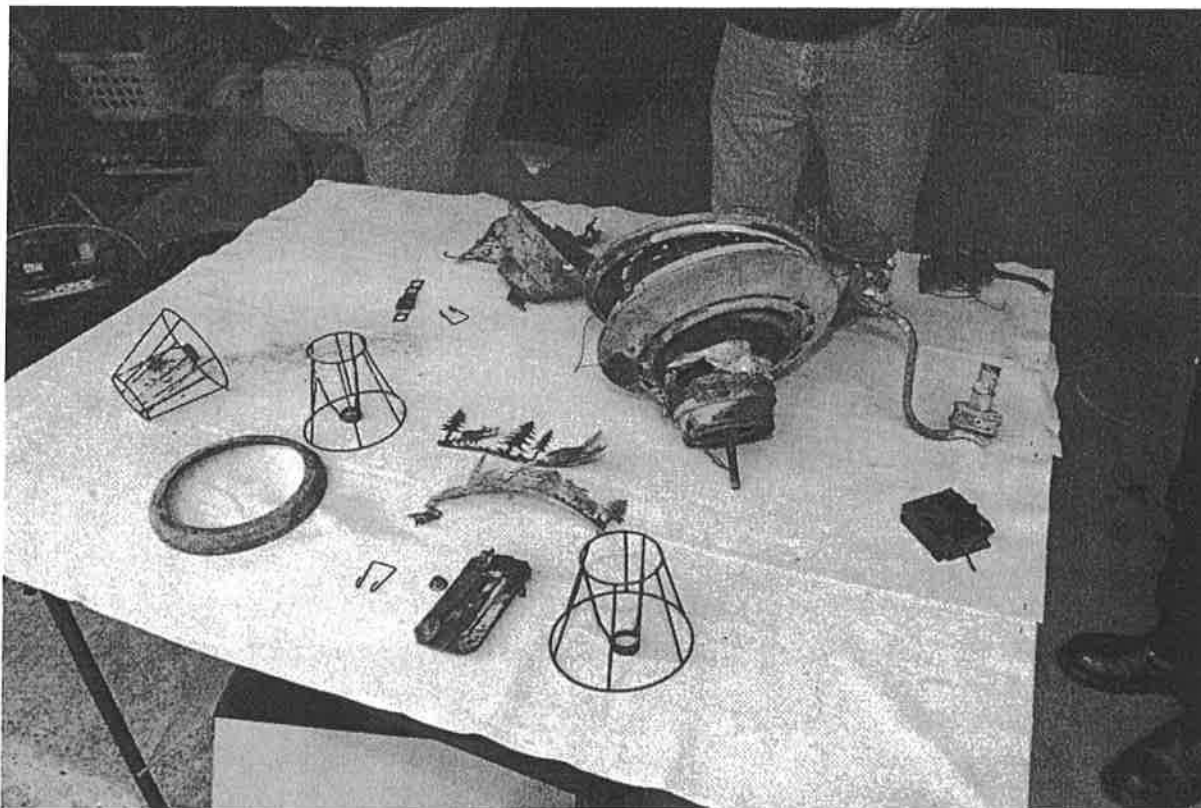
1. He has been self employed with McKean Custom Homes since 1981. He is in a partnership with his brother Rory. Page 12
2. They buy and sell real estate all the time. Page 20
3. He purchased the property in 1986. Page 31
4. 500 gallons of oil were delivered on the morning of the fire. Page 49
5. One window in the kitchen and one in the breakfast nook were open for letting air in for the dogs. Page 51
6. They have 2 dogs, 2 cats, and 2 fish. Page 56
7. The house had hard wired smoke detectors with battery backup. Page 91
8. The house gets hot inside because of all the glass. Page 98
9. The house has central air that wasn't on. Page 99
10. The fan is on during the day for the dogs. Page 100
11. The ceiling fan was about two years old. Page 100
12. He replaced the ceiling fan because his wife didn't like the one he had. Page 101
13. The fan was set to blow down. It may have been purchased at Home Depot. Page 101
14. The windows were typically opened during the day and closed at night. Page 102
15. The lights are on when the fan is on. Page 105
16. He let the dogs out. Page 106.
17. He went back through the house. Page 108
18. He didn't see any smoke when he let the dogs out. Page 116
19. He returned to put the dogs in because it was raining. Page 117
20. When he pulled in the driveway and got out the alarms were going off. Page 118



- 21. He couldn't see in. Everything was black. Page 118
- 22. He called 911. Page 119
- 23. When he opened the kitchen door there was black smoke and heat. Page 120
- 24. Smoke was coming from the back kitchen window. He didn't see any flames. Page 122
- 25. The thermostats melted and turned the A/C on. Page 128
- 26. The fire department is only 3 miles away. They were there within 5 minutes. Page 130
- 27. Windows to the right of the entrance broke out and then he saw flames. Page 132
- 28. They took him in the ambulance. Page 133

**J. PHOTOGRAPHS FROM MY DECEMBER 10, 2012 INSPECTION**

1. Mr. Jones brought the ceiling fan/light parts that were retrieved from the fire back to the site of the fire for a destructive examination. **See Figure 11**



**Figure 11**

2. The pieces were placed in an orientation approximately like would have been expected of an assembled ceiling fan/light. See **Figures 12 - 13**



**Figure 12**



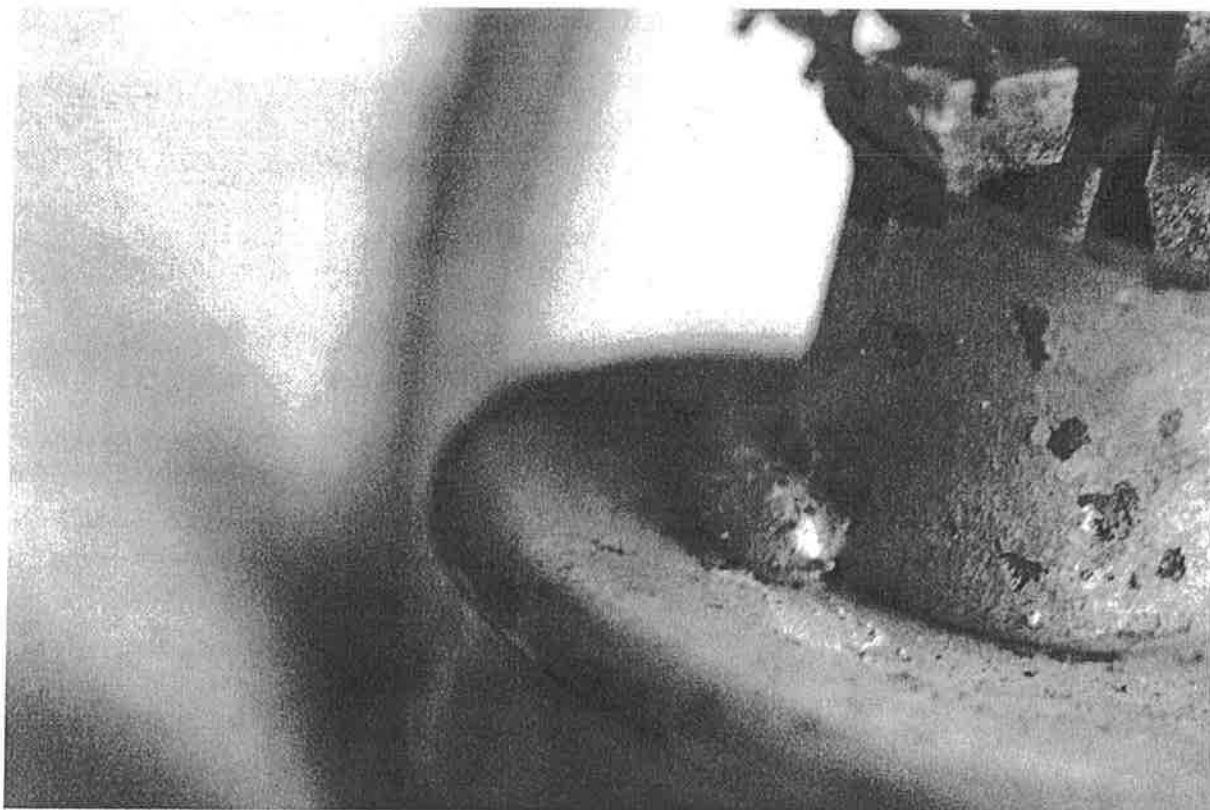
Figure 13

3. The experts that were engaged by the insurance company representatives had seen the ceiling fan/light previously. I asked whether the manufacturer of the ceiling fan/light had been identified. I was informed that the manufacturer had not been identified. I advised the insurance company representatives that were on hand that they may want to preserve their opportunity to subrogate against the manufacturer and asked if they were comfortable with us proceeding with destructive testing with the manufacturer not being represented. I was assured that destructive testing could proceed.

4. There is evidence of melted and solidified metal in the area of the lamp holders. See **Figures 14 - 15**

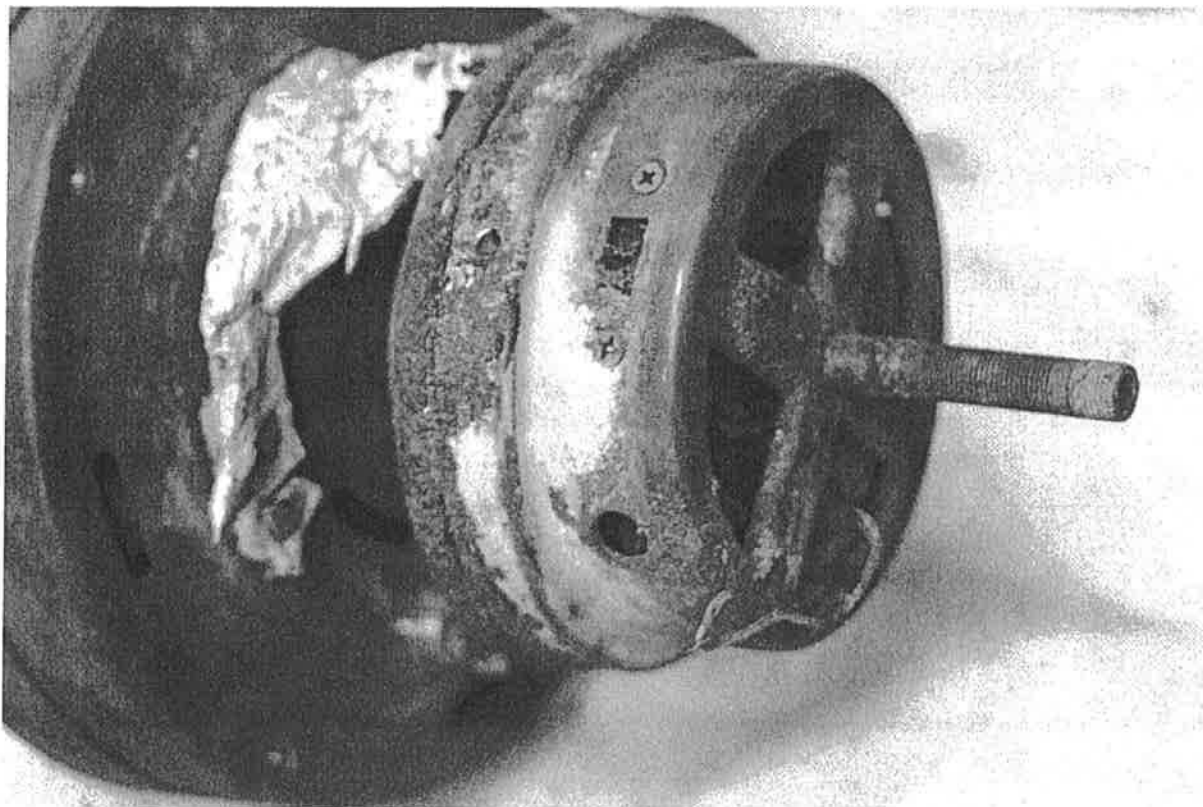


**Figure 14**



**Figure 15**

5. The switch housing was opened. Inside the switch housing there is evidence of melted and resolidified copper wiring. See Figures 16 – 19 for examples



**Figure 16**

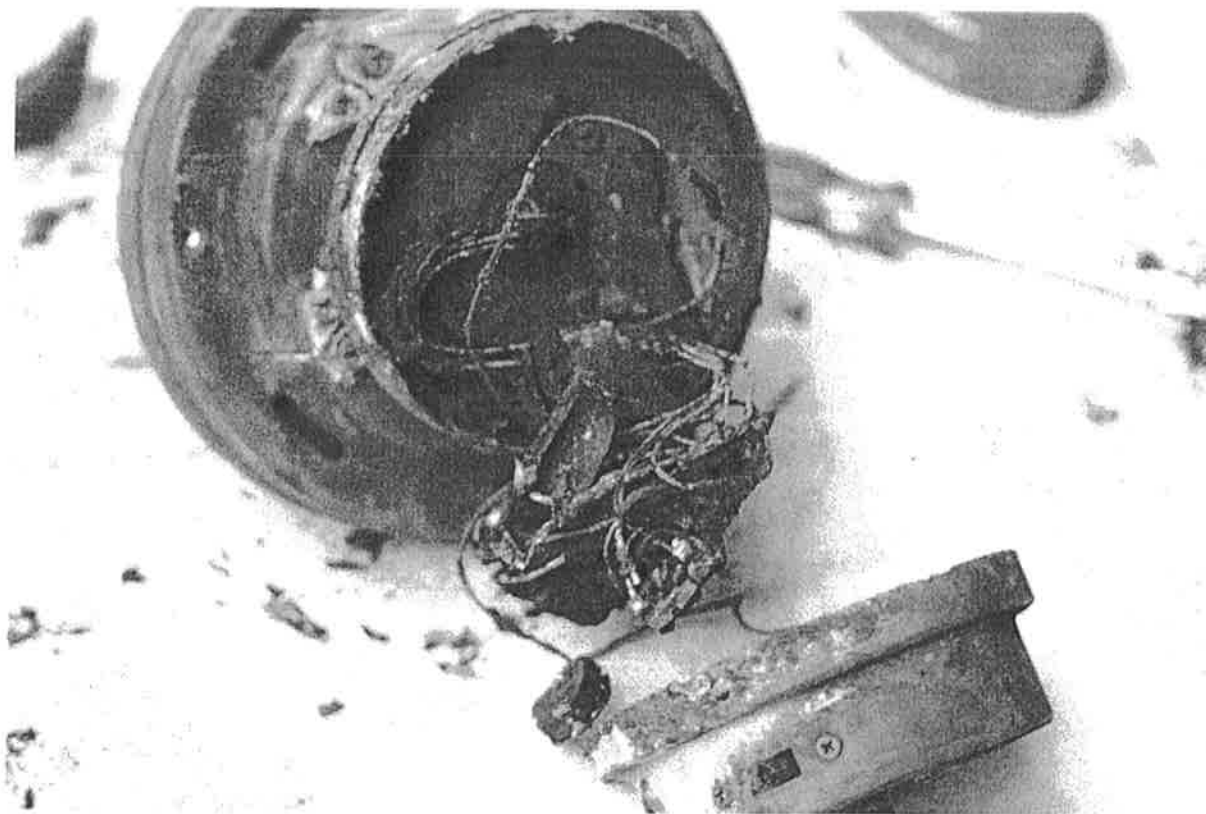
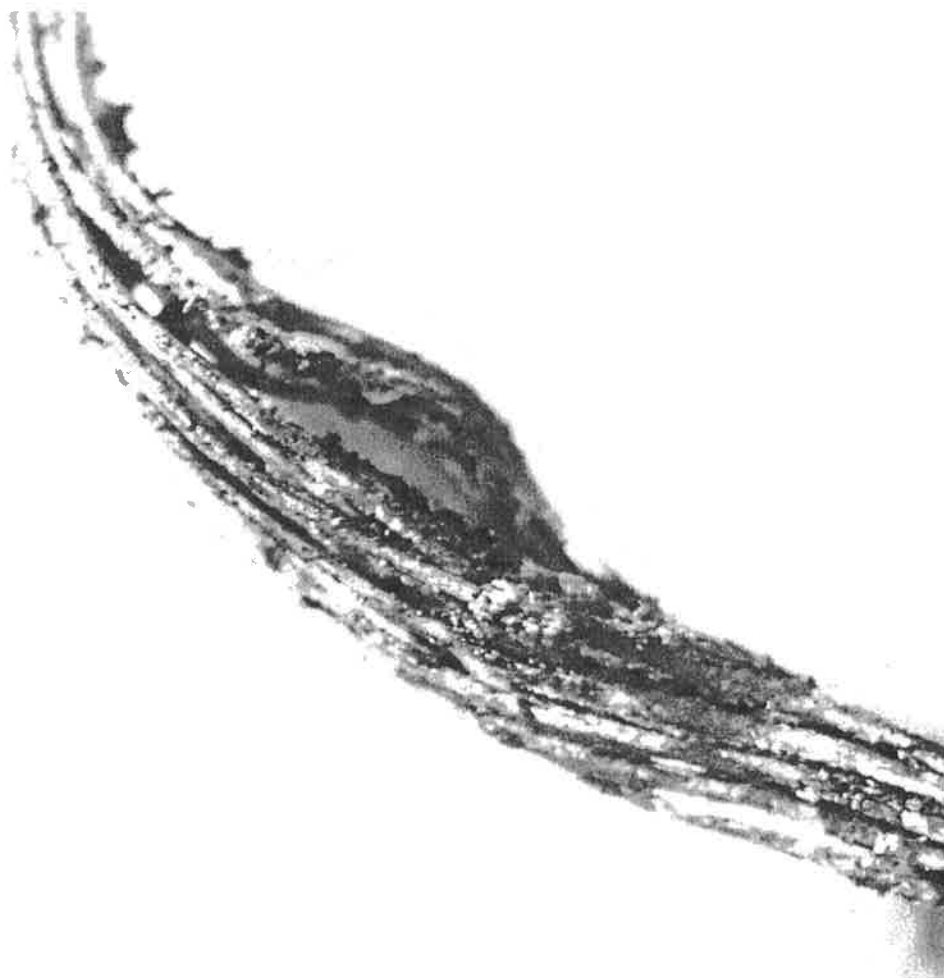
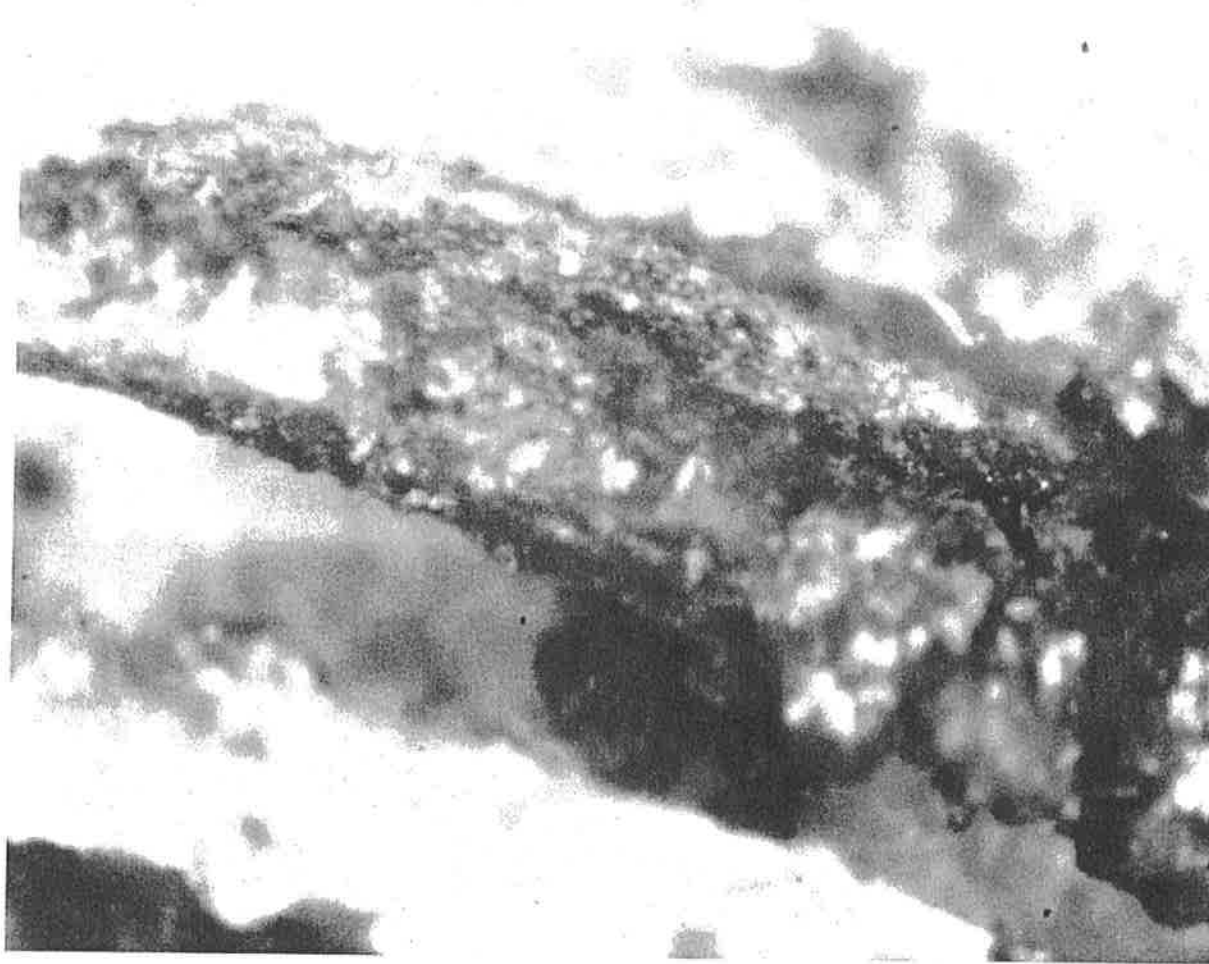


Figure 17



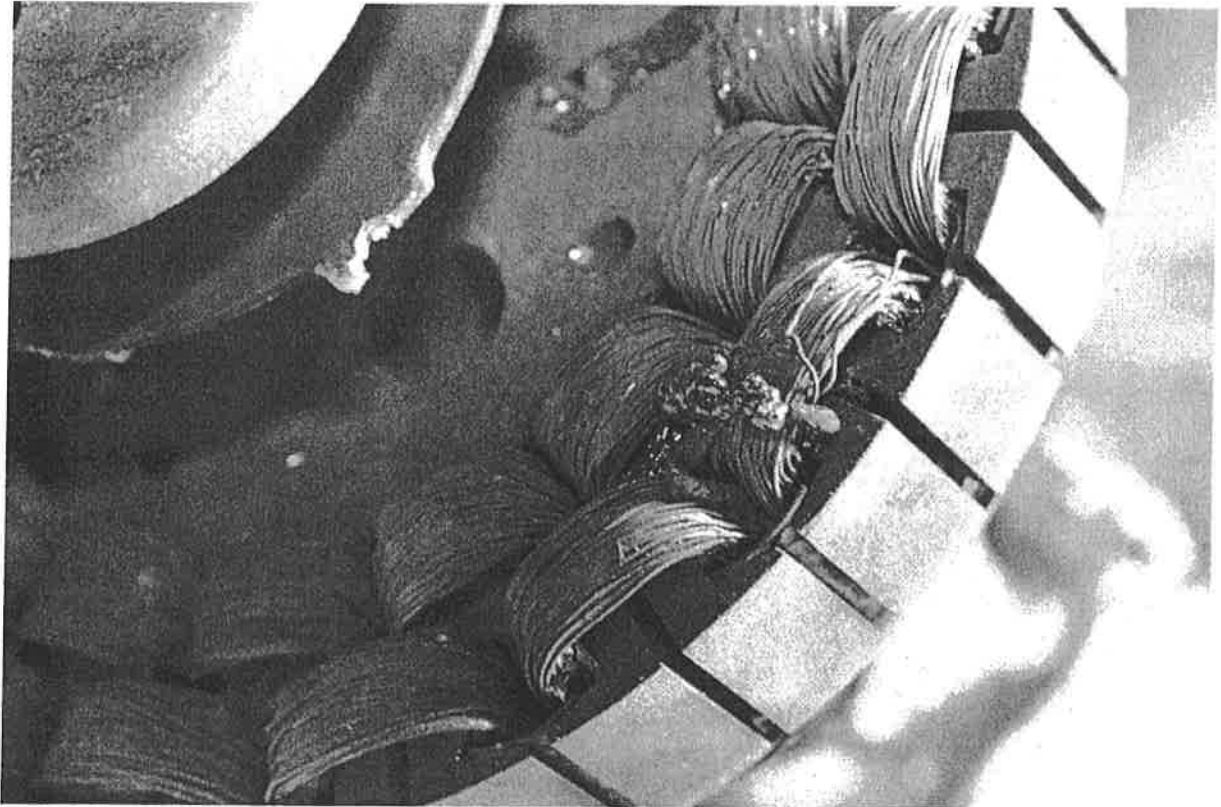


**Figure 18**



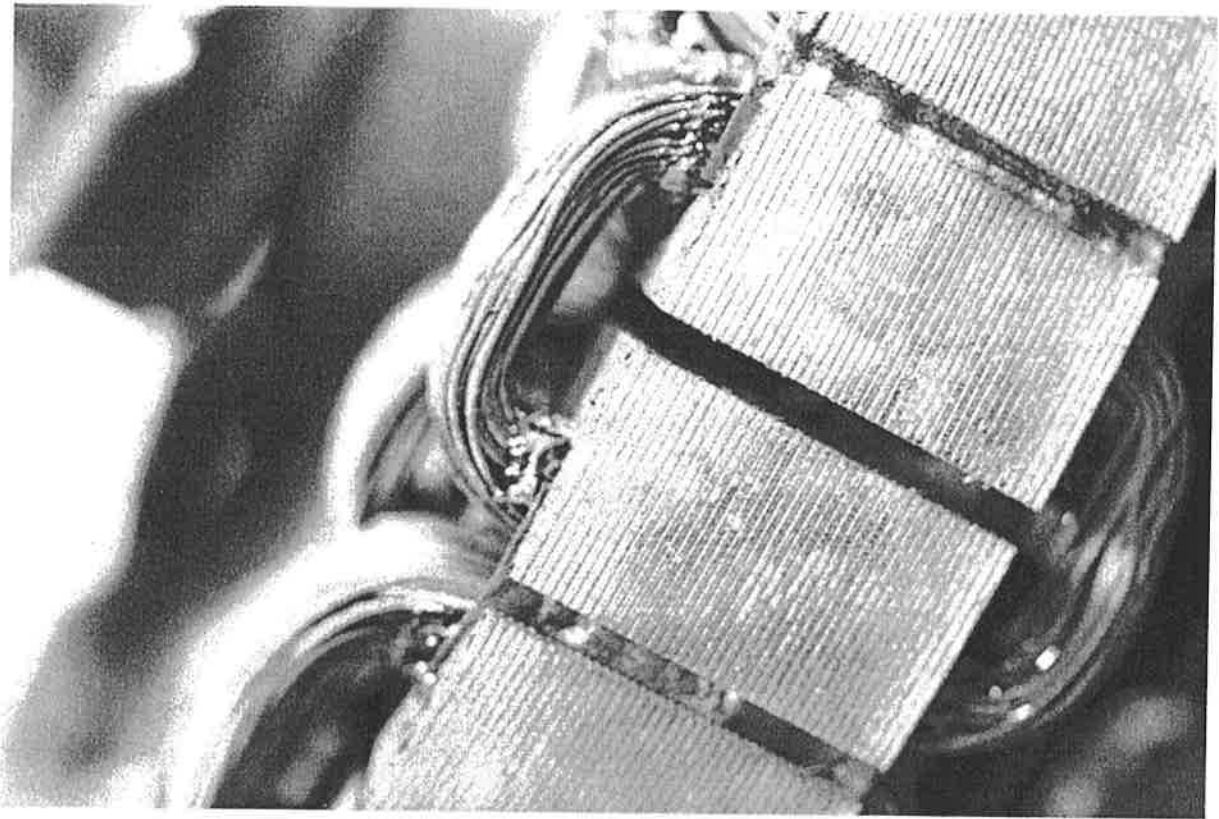
**Figure 19**

6. The motor housing was opened to expose the motor windings. There are melted materials

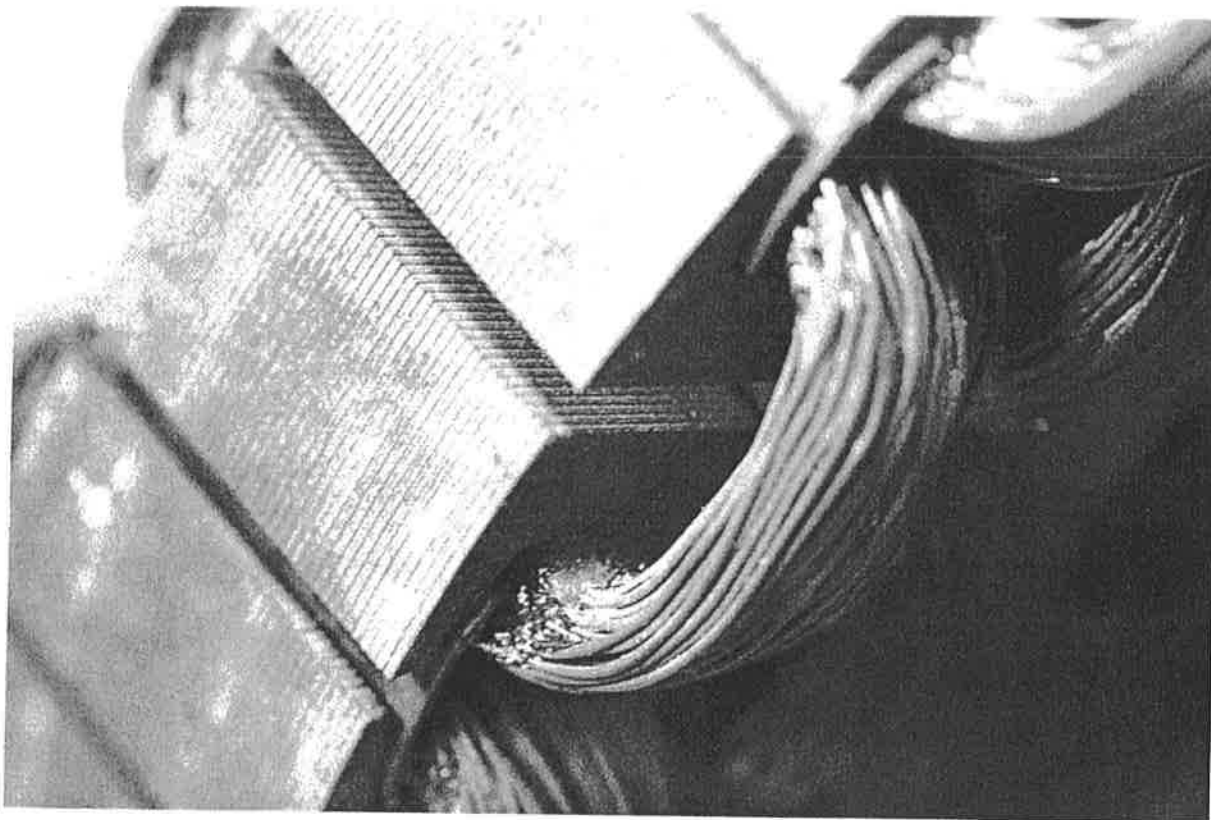


**Figure 20**

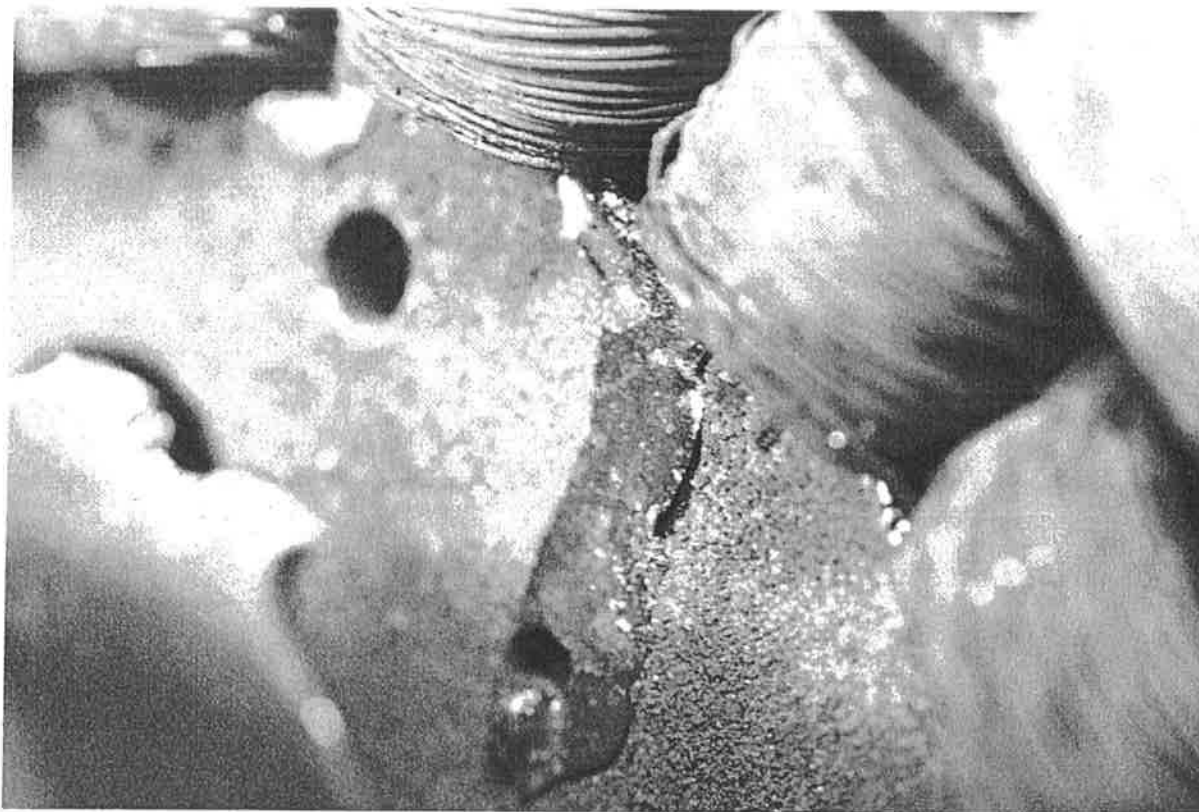
7. Damage to the windings lessens with greater distance from the laminated core.



**Figure 21**



**Figure 22**



**Figure 23**

8. A circuit breaker was in the container of retrieved evidence. The individual that removed it was not present at the inspection.

## K. ANALYSIS

The ceiling fan/light design includes power wiring, switches, lamp holders, and motor windings. When the power is switched on the wiring is energized with 120 Volts AC. Electrical current flows through the lamps and through the motor windings. The motor windings provide magnetism that causes the turning force for making the paddles rotate. Switch positions determine the speed and direction of the paddles.

The heaviest burning occurred in the area of the living room in the space that included the ceiling fan/light and the sofa. There is less burning of materials as distance from this area increases. The origin of the fire is in the living room in the area of the ceiling fan/light and the sofa.

There is melted and resolidified metal in the area of the lamp holders. There is melted and resolidified copper on the wiring in the area of the switches that resulted from arcing. There is damage to the motor windings which lessens as distance increases from the laminated core. Insulation of wiring that is compromised and allows current to flow in unintended paths results in arcing. Arcing is a well known cause of fires. Motor windings increase in temperature when current flows through them. Increasing mechanical load due to circumstances including bearing failure can cause windings to overheat. Overheated motor windings can cause temperatures to rise to the point of igniting nearby materials. Overheated or burning parts from a ceiling fan/light can ignite things that they fall upon. The evidence of the ceiling fan/light is consistent with being a cause of a fire. The ceiling fan/light could not be ruled out as a cause of the fire.

Mr. Jones ruled out the ceiling fan/light as a cause before it was thoroughly examined. He determined what he considered to be separate origins of fires. All of the points he determined to be origins are within the same building space. Burning embers from a smoldering fire can become airborne and fall upon other fuels and ignite them. With no walls between the points Mr. Jones considers origins, there is nothing to prevent the burning debris from spreading the fire to additional points that are disconnected. The evidence of burned debris in numerous places in the house shows that burning .

Spreading of fire that can appear as multiple origins is well known in the scientific and engineering communities. The National Fire Protection Association (NFPA) 921 Guide for Fire and Explosion Investigations 2011 Edition states:

22.2 Incendiary Fire Indicators. There are a number of conditions related to fire origin and spread that may provide physical evidence of an incendiary fire cause.

22.2.1 Multiple Fires. Multiple fires are two or more separate, nonrelated, simultaneously burning fires. The investigator should search to uncover any additional fire sets or points of origin that may exist. In order to conclude that there are multiple fires, the investigator should determine that any "separate" fire was not the natural outgrowth of the initial fire.

22.2.1.1 Fires in different rooms, fires on different stories with no connecting fire, or separate fires inside and outside a building are examples of multiple fires. A search of the fire building and its surrounding areas should be conducted to determine whether there are multiple fires.

22.2.1.2 Separate fires that are not caused by multiple deliberate ignitions can result from the following:

- (1) Fire spread by conduction, convection, or radiation
- (2) Fire spread by flying brands
- (3) Fire spread by direct flame impingement
- (4) Fire spread by falling flaming materials (i.e., drop down) such as curtains
- (5) Fire spread through shafts, such as pipe chases or air conditioning ducts
- (6) Fire spread within wall or floor cavities within "balloon construction"
- (7) Overloaded electrical wiring
- (8) Utility system failures
- (9) Lightning

Mr. Jones did not provide any basis for how he determined that the fires he considered to be separate weren't the outgrowth of the initial fire. He ruled out the fan/light as a cause before it was thoroughly examined and before the evidence of arcing and localized heating was uncovered. He made a ruling before an acceptable level of certainty was determined.

It is well known in fire investigation that until an acceptable level of certainty can be proven, the proper classification of the cause is undetermined. The National Fire Protection Association (NFPA) 921 Guide for Fire and Explosion Investigations 2011 Edition states:

19.2.1.4 Undetermined Fire Cause. Whenever the cause cannot be proven to an acceptable level of certainty, the proper classification is undetermined.

Mr. Jones should have ruled the cause of this fire as undetermined.



#### L. FINDINGS

Within the bounds of reasonable engineering certainty, and subject to change if additional information becomes available, it is my professional opinion that:

1. The ceiling fan/light above the living room could not be ruled out as a cause of the fire.
2. The cause of this fire is undetermined.



Daryl Ebersole, P.E., CFEI